

## LAKE COUNTY, ILLINOIS

# 2010 SLOUGH LAKE SUMMARY REPORT

PREPARED BY THE LAKE COUNTY HEALTH DEPARTMENT

POPULATION HEALTH ENVIRONMENTAL SERVICES



Microcystis Algae Bloom in Slough Lake, 2010

Slough Lake is a 38-acre glacial lake, once housing thousands of ducks when it was part of a duck farm from the 1940's until 1989 at which time the Lake County Forest Preserve District acquired the property from the Weber family.

Slough Lake is situated in a 560-acre watershed and is listed as impaired by the Illinois Environmental Agency (IEPA) for total

phosphorus and total suspended solids. The infestation of carp in Slough Lake likely contributes to the lakes impairments, due to the distribution of bottom sediments into the water column.

Slough Lake is lacking aquatic vegetation to compete against algae, which leads to algae blooms.

In past monitoring years, the chloride concentrations

were elevated above the USEPA chronic toxicity limit for chloride of 250 mg/L, although not above the IEPA general use standard of 500 mg/L.

According to Lake County Health Department's Environmental Services record, in 2000 Slough Lake had strong thermal stratification, however the lake had not stratified in 2006 nor 2010

### SPECIAL POINTS OF INTEREST:

- *Phosphorus*
- *Total Suspended Solids*
- *Carp*
- *Chlorides*
- *Algae Blooms*
- *Submerged Aquatic Vegetation*

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## WATER CLARITY AND TOTAL SUSPENDED SOLIDS

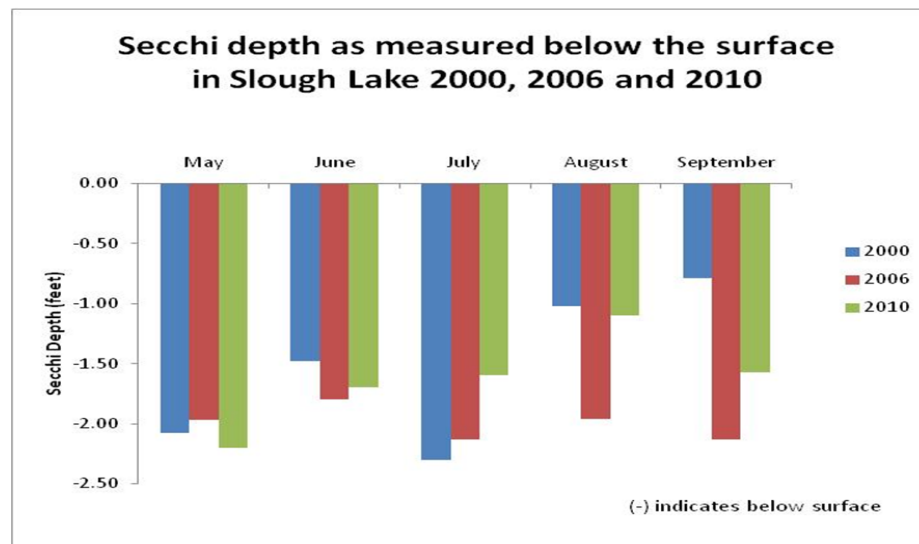
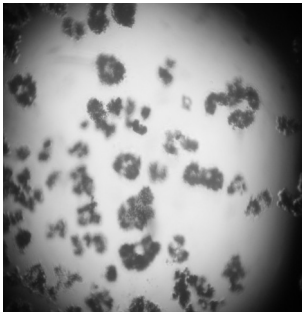


Figure 1. *Mycrocystis aeruginosa*, a cyanobacteria collected from Slough Lake, September, 2010. (photo taken by Kelly Deem, LCHD)



The water clarity as measured by Secchi disk depth in Slough Lake remains very poor but has improved since 2006. It ranked 123 out of 152 lakes based on Secchi data collected between 2000 and 2010.

The average Secchi depth recorded during 2010 was 1.63 feet. The range of depths measured during the monitoring period were 1.10 ft. (August) to 2.20 ft. recorded in May.

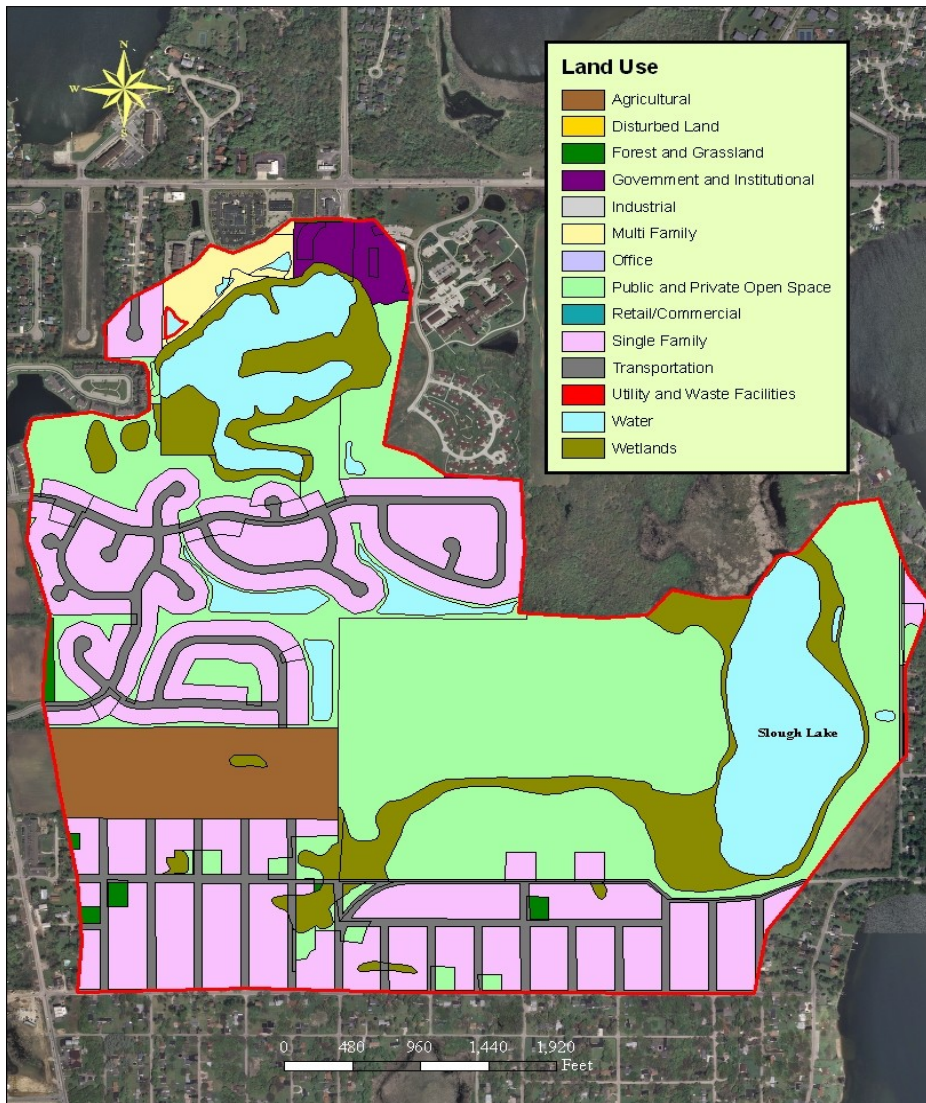
Slough Lake was infested with carp during 2010 and carp are likely the main cause for the very low water clarity measures. Carp are notorious for distributing bottom sediments into the water column such that it takes on the appearance of chocolate milk. Slough Lake is listed by the IEPA as impaired for total suspended solids (TSS). Total suspended solids and water clarity are negatively correlated, in other words, Secchi depths

decrease as the amount of TSS increase.

The Secchi depth was better during 2006, when clarity was around 2 feet below the water surface. In 2010 water clarity was best in May and June. However, water clarity was poor for the remainder of the season. The steady decline is likely a result of carp and increasing algae populations beginning in July and continuing for the remainder of the season. During a visit in September an algal sample was collected, it turned out to be dominated by a cyanobacteria called *Mycrocystis aeruginosa*. This cyanobacteria is one of the genus' that are known to potentially produce toxins that can cause health issues (e.g. skin irritations) in humans. Animals should not be allowed to drink from infested waters when these blooms are occurring.

TSS can be broken down into inorganic (NVSS), organic (TVS) and dissolved solids (TDS). The average NVSS calculated in 2010 was 10.19 mg/L, an improvement from 18.80 mg/L estimated in 2006. In August the maximum concentration was calculated to be 14.72 mg/L. The average surface TVS was 140 mg/L, this is worse than the median epilimnetic TVS concentration of lakes sampled from 2000 to 2010, which was 123.0 mg/L. These results indicate that both sediment and algae are problems in Slough Lake.

## WATERSHED



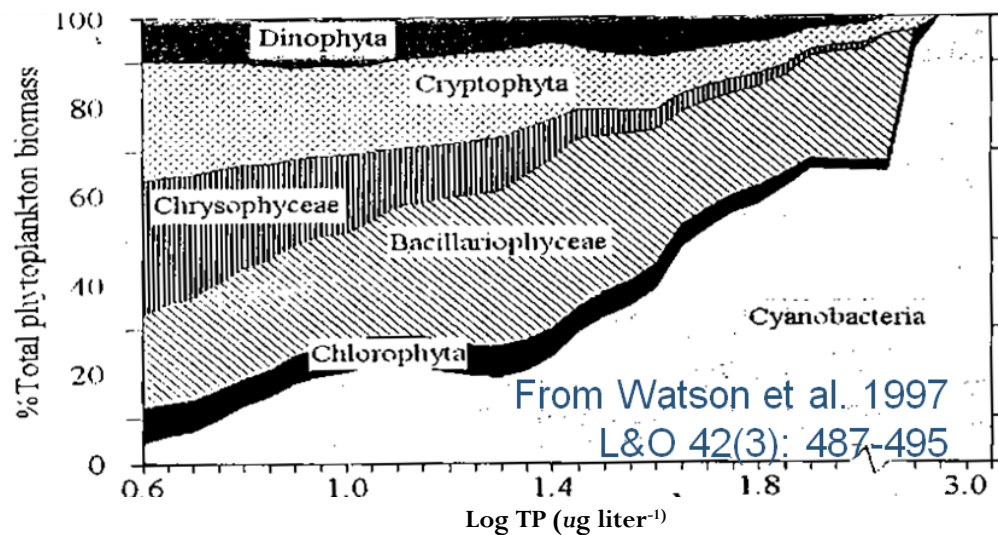
Slough Lake is at the top of its watershed, and feeds through an extensive wetland extending from the area of the dam to the lake's original outlet near Grand Avenue then into Crooked Lake.

Slough Lake's watershed is approximately 561 acres and based on the morphology of the lake, it has a retention time of approximately a year (345.5 days). The dominant

land use found in the watershed was Public and Private Open Space (31.9%) and Single Family (27.8%) (Table 3). These two land uses also contributed the greatest percentage of total runoff, although their ranking changed with Single Family contributing an estimated 41.9% total runoff and Public and Private Open Space an estimated 24.1%. Transportation, while only representing 9.1%

of the watershed land use came in at a close third in terms of estimated percent runoff, at 23%. Although not a dominant land use, transportation can contribute heavily to the amount of runoff entering a lake. For instance, chloride, as well as phosphorus in Slough Lake were elevated even though transportation is a relatively minor land use in the watershed.

## NUTRIENTS



Slough Lake is listed as impaired for phosphorus by the IEPA as it has total phosphorus (TP) concentrations that well exceed the Illinois standard of 0.05 mg/L.

TP concentrations in Slough Lake ranged from 0.224 mg/L to 0.591 mg/L. The average phosphorus concentration of 0.386 mg/L and ranked Slough Lake at 162nd of 165 lakes in the county from samples taken between 2000 and 2010.

As phosphorus concentrations increase there is a subsequent

increase in phytoplankton biomass and potentially more of the biomass is represented by cyanobacteria species, which may cause health issues to humans.

Unlike most lakes which are phosphorus limited, Slough Lake is a nitrogen limited lake, as determined by the total nitrogen to total phosphorus ratio TN:TP. Slough Lake being a nitrogen limited lake means that any addition of nitrogen into this phosphorus rich system will result in excessive plant or algal

growth. There were very few plants found in the lake during the submersed aquatic plant monitoring date (July 30), however, algal blooms were noted during the entire monitoring season. Nitrogen concentrations can determine which algal species are found in a lake, and lakes with low TN:TP concentrations as is the case with Slough Lake, tend to be dominated by cyanobacteria. Recall that in September the lake was dominated by the cyanobacteria *Microcystis aeruginosa*.

Carp are likely responsible for a large component of Slough Lake's nutrient problems, as they distribute nutrient rich bottom sediments into the water column. Additionally, anoxic conditions near the bottom of the lake during June, July and September allow for the release of phosphorus from bottom sediments.

### Comparison of 2010 TP concentrations of Slough, Crooked and Hastings Lakes

Month	Slough	Crooked	Hastings
May	0.224	0.080	0.047
June	0.313	0.048	0.058
July	0.396	0.049	0.039
August	0.591	0.063	0.037
September	0.405	0.108	0.078
Average	0.386	0.070	0.052



## NUTRIENTS CONTINUED

Slough Lake is at the top of it's watershed, therefore, activities taking place in the watershed can have huge impacts to the lake. However, further evaluation of the watershed containing Slough Lake indicates that elevated phosphorus levels in the lake are likely a result of internal nutrient cycling versus impacts coming from within Slough Lake's immediate watershed. In order for Slough Lake to be rehabilitated, the carp population needs to be substantially reduced as well as the nutrient rich sediment removed or inactivated, otherwise internal loading will hamper restoration efforts.

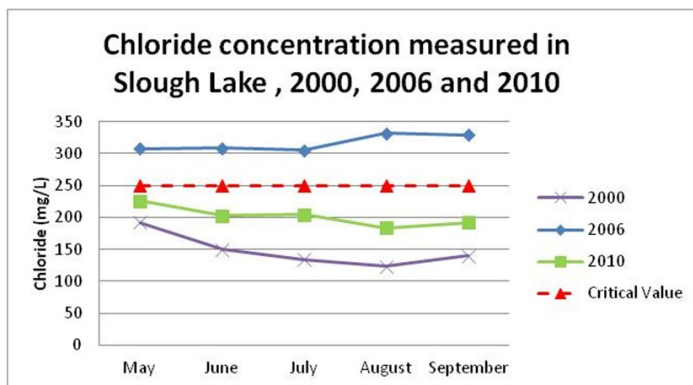
However, it remains a good practice for landowners in the watershed to follow best management practices to reduce impacts from nutrients to Slough Lake.

Two nutrients , nitrogen (N) and phosphorus (P) both play an important role in water quality. It is difficult to control nitrogen inputs into a system, as sources of nitrogen span beyond our control (i.e. atmospheric deposition). However, anthropogenic phosphorus inputs into a lake can be controlled by making wise management decisions on how we handle materials containing phosphorus. One way is through the use of

phosphorus free fertilizer.

Recently, the state of Illinois passed the Lawn Care Products Application and Notice Act. This act changes the law for applying fertilizer by commercial applicators by requiring a soil test; proving the need for phosphorus before applying phosphorus fertilizers to lawns. Regionally, our soils have sufficient phosphorus concentrations present, normally, only when establishing a new lawn, may additional phosphorus be required.

## CHLORIDES



Chloride levels in Slough Lake were lower than what was recorded in 2006, however they remained elevated from what was measured in 2000. The average chloride concentration in 2010 was 202 mg/L. This concentration is greater than the median epilimnetic concentra-

tion of 142 mg/L four county lakes. A critical value of 250 mg/L Cl<sup>-</sup> has been determined to be the chronic toxicity limit by the USEPA, Cl<sup>-</sup> concentrations above that can be harmful to aquatic organisms. In 2006, chloride concentrations were above the critical threshold of 250 mg/

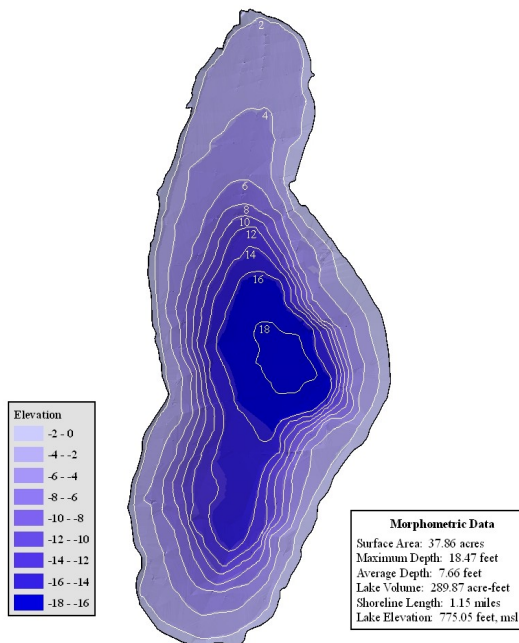
L. Chloride concentrations in 2010 ranged from 226 mg/L (May) to 192 mg/L (September).

Increased chloride concentrations may effect stratification of lakes as the denser salt water sinks to the bottom altering mixing, potentially disrupting the lake ecosystem.

ONE TEASPOON  
OF SALT CAN  
CONTAMINATE 5  
GALLONS OF  
WATER (280  
MG/L CL<sup>-</sup>)

## BATHYMETRIC MAP

Bathymetric Map of Slough Lake, Lake County, IL



A bathymetric (depth contour) map is an essential tool for effective lake management since it provides critical information about the physical features of the lake such as depth, surface area, and volume. This information is particularly important when management techniques such as chemical treatments for plant or algae control, dredging, fish stocking or habitat enhancement are part of the lake's overall management plan.

The LCHD-ES used Biosonics equipment along with a Trimble GPS unit with sub-foot accuracy to gather the field data in 2007. Once collected, the data was analyzed and imported into ArcGis for further analysis. In ArcGis, the contours were drawn and the volume was calculated. The resulting bathymetric map is presented (picture at right). Bathymetric maps for Slough Lake can be accessed at <http://www.lakecountyil.gov/Health/want/Pages/LakeMaps.aspx>.

## AQUATIC PLANTS



Common Duckweed

In July 2010 a comprehensive sampling was conducted at 30 points within Slough Lake. Common duckweed (*Lemna minor*) was detected at two locations (7% of the sites assessed). The average cover calculated for the lake was 0.05%. Common duckweed is a native. There were no non-native aquatic species found in Slough Lake.

The floristic quality of the open water areas of Slough Lake is 5, which ranks it 146 out of 154 lakes assessed in Lake County. LCHD-ES recommends reduction-removal of common carp from Slough Lake. If the LCFPD were to follow this recommendation, it is likely that there would be an explo-

sion of plants colonizing the lake bottom at least until the depths exceeded those of the 1% light level. This is the standard level of light needed for plants to be able to grow. It is unclear due to the lack of vegetation in the lake, what plants might colonize, however, it is recommended that the LCFPD embellish the area with native propagules.

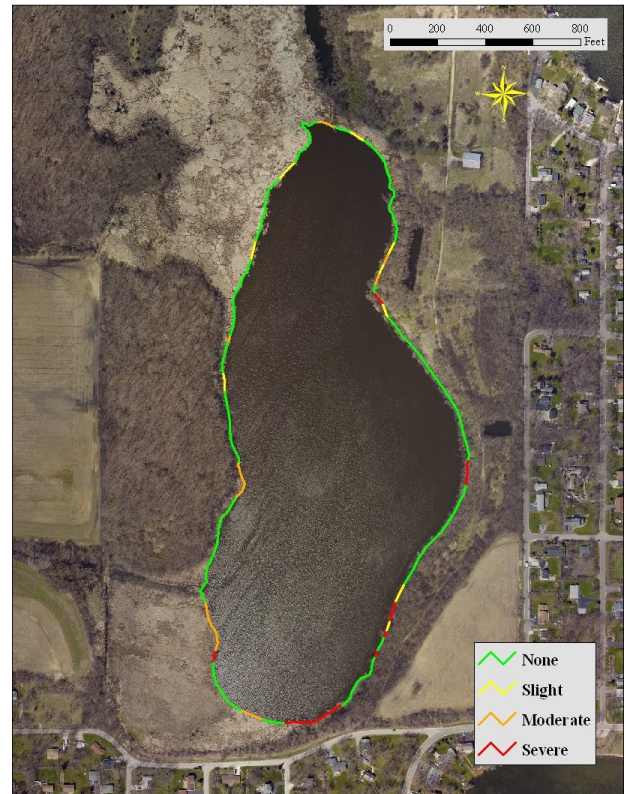
## SHORELINE EROSION

Shoreline erosion occurring in Slough Lake was evaluated in 2010. Due to the poor water clarity, and impaired water quality parameters, TSS and phosphorus, it is important to address the sources of the impairment including erosion.

Slough Lake's assessment estimated 30% of the shoreline had some degree of erosion occurring on it. Much of the erosion occurred in areas dominated by cattail. Twenty-one percent of the erosion found was either moderate or severe. The LCFPD should investigate solutions to all areas of erosion, concentrating on areas of severe to moderate erosion as these areas are likely contributing to poor water quality in Slough Lake. Areas with only slight erosion should also be addressed as they are usually much easier and more affordable to fix.

LCHD-ES recommends installing native wetland plant propagules into areas where erosion is occurring. This may assist in anchoring soils and reducing erosion into lake.

Shoreline erosion assessed September 2010	
Degree of Erosion	%
No Erosion	70%
Slight	9%
Moderate	11%
Severe	10%
Total Shoreline	100%



## SHORELINE PLANTS

In September 2010, concurrent to erosion assessment, a species list was developed for vegetation along the lake edge. Cattail (*Typha* spp.) was the dominant vegetation along much of the lake. It was noted that common buckthorn (*Rhamnus cathartica*), Bur Oak (*Quercus macrocarpha*) and ash (*Fraxinus* spp.) were among the woody species colonizing the area. Other forbs detected were purple loosestrife (*Lythrum salicaria*), False nettle

(*Boehmeria cylindrica*), clearweed (*Pilea pumila*) and orange jewelweed (*Impatiens capensis*). A complete listing of species found is listed (Right).

Scientific Name	Common Name
<i>Rhamnus cathartica</i>	Common Buckthorn
<i>Vitis riparia</i>	Wild Grape
<i>Quercus macrocarpha</i>	Bur Oak
<i>Fraxinus</i> spp.	Ash
<i>Bidens frondosa</i>	Common Beggar's Ticks
<i>Solanum dulcamara</i>	Bittersweet Nightshade
<i>Lythrum salicaria</i>	Purple Loosestrife
<i>Boehmeria cylindrica</i>	False Nettle
<i>Echinocystis lobata</i>	Wild Cucumber
<i>Pilea pumila</i>	Clearweed
<i>Xanthium strumarium</i>	Cocklebur
<i>Parthenocissus quinquefolia</i>	Virginia creeper
<i>Acer negundo</i>	Boxelder
<i>Impatiens capensis</i>	Orange Jewelweed
<i>Urtica procera</i>	Tall Nettle
<i>Plantago major</i>	Common Plantain
<i>Solidago gigantea</i>	Late Goldenrod
<i>Carex lacustris</i>	Common Lake Sedge



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**[http://www.lakecountyiil.gov/  
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BeachLakeInfo.htm](http://www.lakecountyiil.gov/Health/want/BeachLakeInfo.htm)**

Protecting the quality of our lakes is an increasing concern of Lake County residents. Each lake is a valuable resource that must be properly managed if it is to be enjoyed by future generations. To assist with this endeavor, Population Health Environmental Services provides technical expertise essential to the management and protection of Lake County surface waters.

Environmental Service's goal is to monitor the quality of the county's surface water in order to:

- Maintain or improve water quality and alleviate nuisance conditions
- Promote healthy and safe lake conditions
- Protect and improve ecological diversity

Services provided are either of a technical or educational nature and are provided by a professional staff of scientists to government agencies (county, township and municipal), lake property owners' associations and private individuals on all bodies of water within Lake County.

## RECOMMENDATIONS

Slough Lake's water quality is very poor. It is listed as an impaired water body by IEPA for TP and TSS. It is highly recommended from the LCHD-ES that the LCFPD initiate the following to improve the poor conditions found in Slough Lake:

- Removal of Common Carp. Internal cycling of nutrients such as phosphorus, high TSS and low water clarity, accompanied by lack of aquatic vegetation are all likely due to the abundance of carp in Slough Lake.
- Nutrient reduction: A long term rehabilitation goal should be the removal or inactivation of the nutrient rich bottom sediments. This should be initiated after removal of carp and before to native plant establishment.
- Shoreline Stabilization. Stabilizing areas of erosion occurring along the lakeshore as it too contributes to the phosphorus and TSS impairments.
- Establishing submerged aquatic vegetation. If carp are removed from the lake, it is possible and likely that vegetation will begin to establish, however, it is uncertain as to the quality of vegetation that would establish, so embellishment by native propagule is recommended. Submerged aquatic vegetation would provide competition to algal populations resulting in higher water clarity and lower TSS.
- Finding outreach opportunities to communicate outside of the Forest Preserve to reduce the amount of chloride containing deicing chemicals (ie. road salt) being applied while still maintaining safe passageways.
- Participation in the VLMP program. This assists the LCHD with the health of the lake on years that they are not actively monitoring the lake and could assist the LCFPD in making management decisions on the lake in subsequent years.



Photo Credit:  
Gary Sullivan  
The Wetlands Initiative